

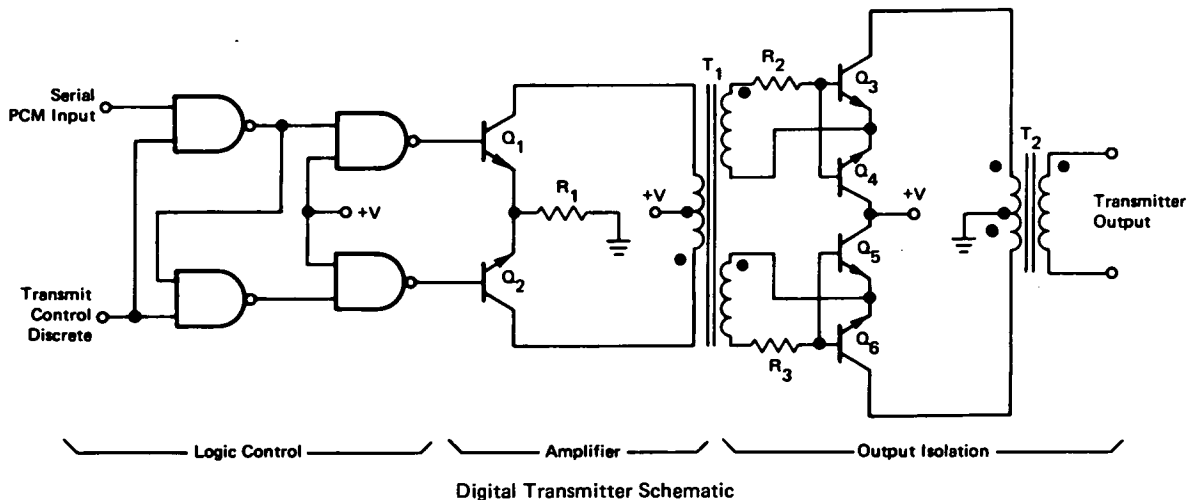
NASA TECH BRIEF

Lyndon B. Johnson Space Center



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Digital Transmitter for Data Bus Communications System



The problem:

Digital transmitters generating high bit rates require low impedance coupling to a data bus for efficient signal power transfer. However, a high impedance coupling is needed for isolation of the transmitter from the data bus when the transmitter is idling or off. Current methods and devices used to improve output isolation are deficient in several ways:

1. They increase the active input impedance which reduces the power transfer efficiency.
2. They require complex circuits, often with high supply voltages.
3. They need both positive and negative supply voltages.
4. Their isolation characteristics remain inadequate with power off.

The solution:

A digital transmitter designed for Manchester coded signals (and all signals with ac waveforms) generated at a rate of one megabit per second includes an efficient output isolation circuit.

How it's done:

The transmitter consists of a logic control section, an amplifier, and an output isolation section (see figure). The output isolation circuit provides a dynamic impedance at the terminals as a function of the amplifier output level.

Dynamic impedance is provided by two series transistor pairs, Q₃, Q₄, and Q₅, Q₆, which serve as open switches except when they are toggled by a base emitter signal of proper polarity. A positive signal level at resistor R₂ forward biases the base-emitter junctions of Q₃ and Q₄, driving them into low-impedance conduction. A negative signal level at R₂, on the other hand, reverse biases the base-emitter junctions, driving them into their high-impedance cutoff state. In the forward biased state, current is supplied from +V controlled by the collector-emitter impedance. Since Q₃ is operated in the inverted mode, the effective current gain is approximately one to two. Since R₂ limits the base current, the maximum output current through Q₃, Q₄ is therefore limited to a value commensurate with the base current and inverted mode

(continued overleaf)

current gain. Thus, as the load impedance decreases, the output current proportionally increases until it reaches the current limit. Further decreases in load impedance have little effect on output current; instead, there is a corresponding decrease in transmitter output voltage.

The functions and operation of Q_5 , Q_6 , and R_3 are identical to those described for Q_3 , Q_4 , and R_2 . Bilevel output signals are generated by driving Q_3 , Q_4 into conduction and Q_5 , Q_6 into cutoff, and then reversing the drive polarity. The signals which alternately occur at Q_3 and Q_6 collectors, are coupled to the load by a hybrid transformer T_2 through its noninverting and inverting windings, respectively. The resultant transmitter output is a balanced differential signal that is dc isolated from the transmitter circuits.

Note:

Requests for further information may be directed to:
Technology Utilization Officer
Johnson Space Center
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Houston, Texas 77058
Reference: TSP73-10511

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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